

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号  
特開2001-122884  
(P2001-122884A)

(43) 公開日 平成13年5月8日 (2001.5.8)

(51) Int.Cl. <sup>7</sup>	識別記号	F I	テ-マ-ト* (参考)
C 0 7 F 9/10		C 0 7 F 9/10	A 4 B 0 2 6
A 2 3 D 9/007		A 2 3 J 7/00	4 H 0 5 0
// A 2 3 J 7/00		A 2 3 D 9/00	5 1 6

審査請求 未請求 請求項の数4 O L (全 5 頁)

(21) 出願番号 特願平11-303577

(22) 出願日 平成11年10月26日 (1999. 10. 26)

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(54) 【発明の名称】 ホスファチジルセリン高含有油溶組成物の製造法

(57) 【要約】

【課題】 ホスファチジルセリンを高濃度に含有することができ、しかも、得られたものは透明かつ流動性が高い特徴を有する油溶組成物を製造する。

【解決手段】 ホスファチジルセリン高含有リン脂質を、ホスファチジルエタノールアミン又はホスファチジルエタノールアミン及びホスファチジルコリンと共に液状油脂に溶解する方法。

## 【特許請求の範囲】

【請求項 1】 ホスファチジルセリン高含有リン脂質を、ホスファチジルエタノールアミン又はホスファチジルエタノールアミン及びホスファチジルコリンと共に液状油脂に溶解することを特徴とするホスファチジルセリン高含有油溶組成物の製造法。

【請求項 2】 請求項 1 に記載されたホスファチジルセリン高含有油溶組成物の製造法において、ホスファチジルセリン高含有リン脂質として、ホスファチジルセリンを 20 重量%以上含むリン脂質組成物を用い、

このリン脂質組成物を、最終リン脂質組成に対するホスファチジルエタノールアミン含量が 5～40 重量%、又はホスファチジルエタノールアミン含量が 5～40 重量%で且つホスファチジルコリン含量が 5～40 重量%になるように前記液状油脂に加えることを特徴とするホスファチジルセリン高含有油溶組成物の製造法。

【請求項 3】 請求項 2 に記載されたホスファチジルセリン高含有油溶組成物の製造法において、前記リン脂質組成物を、最終リン脂質組成に対するホスファチジルエタノールアミン含量が 10～20 重量%、又はホスファチジルエタノールアミン含量が 10～20 重量%で且つホスファチジルコリン含量が 10～20 重量%になるように前記液状油脂に加えることを特徴とするホスファチジルセリン高含有油溶組成物の製造法。

【請求項 4】 請求項 1～3 に記載された何れかの製造方法によって得られたホスファチジルセリン高含有油溶組成物。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明はホスファチジルセリンを含有する油溶組成物を製造するための方法に関するものである。

## 【0002】

【従来の技術】 ホスファチジルセリンは、リン脂質の一種であり、植物や動物に普遍的に存在している物質である。近年、ホスファチジルセリンを 100～300mg/day 摂取することにより、脳機能が改善するという報告があり (Amaducci L. and the SMID group, Psychopharmacol. Bull., 24, p130-134, 1988, Cenacchi T. et al., Aging Clin. Exp. Res., 5, p123-133, 1993)、単なる栄養成分である以上に脳機能改善機能を有する食品成分としてその働きが注目されている。

【0003】 天然の成分に含まれるリン脂質中のホスファチジルセリンは、植物では数%、最も多いとされる動物の脳でも 20% を越えることはない。そのため、生理機能を発揮するだけのホスファチジルセリンを食事から摂取することは困難であり、ホスファチジルセリンを含む組成物を補助的に摂取することが現実的な方法である。

【0004】 ホスファチジルセリンを高濃度に含む組成物を得る方法としては、天然成分から抽出したリン脂質を分画したり、或いはホスファチジル基転移反応により製造する方法などがある。

【0005】 しかしながら、ホスファチジルセリンを高濃度に含有するリン脂質組成物は油脂 (例えば大豆油等) に対する溶解性が低く、熱をかけることにより溶解せしめたとしても温度が下がると固まってしまう食品製造上好ましくない。そのため、油脂に希釈混合して流動性を持たせカプセルに充填できるようにすることが重要となってくる。

【0006】 しかしながら、溶媒である油脂の割合を高めると、最終的な油溶組成物中のホスファチジルセリン含量が低くなってしまう。

【0007】 一方、リン脂質組成物の流動性を向上させる方法としては、広範な種類の酸を加える方法 (米国特許第 2,194,842 号「脂肪酸」、同特許第 2,374,681 号「スルホン酸」、同特許第 2,391,462 号「水性酸」など)、特定の量のマグネシウム、カルシウムおよびアルミニウムのある種の塩を加える方法 (米国特許第 3,357,918 号)、さらにはトコフェロールを加える方法 (特開昭 61-15650 号公報) 等が特許として開示されている。

## 【0008】

【発明が解決しようとする課題】 ところが、これらの方法はホスファチジルセリンを高濃度に含有するという天然成分ではありえないリン脂質組成物を想定しておらず、実際、酸を加える方法以外ではこの油溶組成物の流動性を向上させることはなかった。また、酸を加える方法は有効ではあったものの、酸によると考えられる油溶組成物中のホスファチジルセリンの分解が確認されたため、実用的ではないと考えられた。

【0009】 本発明は、ホスファチジルセリンを高濃度に含有することができ、しかも、得られたものは透明かつ流動性が高い特徴を有する油溶組成物を製造することを目的とする。

## 【0010】

【課題を解決するための手段】 請求項 1 に記載された発明に係るホスファチジルセリン高含有油溶組成物の製造法は、ホスファチジルセリン高含有リン脂質を、ホスファチジルエタノールアミン又はホスファチジルエタノールアミン及びホスファチジルコリンと共に液状油脂に溶解する方法である。

【0011】 請求項 2 に記載された発明に係るホスファチジルセリン高含有油溶組成物の製造法は、請求項 1 に記載されたホスファチジルセリン高含有油溶組成物の製造法において、ホスファチジルセリン高含有リン脂質として、ホスファチジルセリンを 20 重量%以上含むリン脂質組成物を用い、このリン脂質組成物を、最終リン脂質組成に対するホスファチジルエタノールアミン含量が

5～40重量%、又はホスファチジルエタノールアミン含量が5～40重量%で且つホスファチジルコリン含量が5～40重量%になるように前記液状油脂に加える方法である。

【0012】請求項3に記載された発明に係るホスファチジルセリン高含有油溶組成物の製造法は、請求項2に記載されたホスファチジルセリン高含有油溶組成物の製造法において、前記リン脂質組成物を、最終リン脂質組成に対するホスファチジルエタノールアミン含量が10～20重量%、又はホスファチジルエタノールアミン含量が10～20重量%で且つホスファチジルコリン含量が10～20重量%になるように前記液状油脂に加える方法である。

【0013】請求項4に記載された発明に係るホスファチジルセリン高含有油溶組成物は、請求項1～3に記載された何れかの製造方法によって得られた、ホスファチジルセリンを高濃度に含有する油溶組成物についてである。

【0014】

【発明の実施の形態】本発明は、ホスファチジルセリン高含有リン脂質を、ホスファチジルエタノールアミン又はホスファチジルエタノールアミン及びホスファチジルコリンと共に液状油脂に溶解する方法である。これにより、ホスファチジルセリンを高濃度に含有することができ、しかも、透明かつ流動性が高い特徴を有する油溶組成物を得ることができる。

【0015】本発明におけるホスファチジルセリン高含有リン脂質と、ホスファチジルエタノールアミン又はホスファチジルエタノールアミンとホスファチジルコリンの液状油脂への添加の順序は液状油脂にホスファチジルエタノールアミン又はホスファチジルエタノールアミンとホスファチジルコリンとを溶解した後にホスファチジルセリン高含有リン脂質を溶解する順序が好ましく白濁もなく溶解することが可能である。

【0016】本発明のホスファチジルセリン高含有リン脂質は、好ましくは、ホスファチジルセリンを20重量%以上含むものを用いることができる。このホスファチジルセリン高含有リン脂質は、天然成分から抽出したものを濃縮したものでも、D及びL-セリンとの転移反応によって製造あるいは更にそれらを分画濃縮したものでも、有機合成法によって製造したものでも、その製造法に特に制限はない。

【0017】また、本発明のホスファチジルエタノールアミン及びホスファチジルコリンもどのような方法で製造されたものでも良く、最終リン脂質組成が望ましい範囲に含まれるのであれば、ホスファチジルエタノールアミン及びホスファチジルコリンの純度も特に問題としない。

【0018】ホスファチジルセリン高含有リン脂質とホスファチジルエタノールアミン又はホスファチジルエタ

ノールアミンとホスファチジルコリンを溶解する液状油脂は、常温で液状であればよい。例えば、大豆油、コーン油、ペニバナ油、オリーブ油、落花生油等の植物性の油脂でも、魚油のような動物性油脂でも酵素エステル合成によって製造された中鎖脂肪酸トリグリセリド等の油脂等でもよく、各々のジグリセリド、モノグリセリドでも構わないが、短い脂肪酸組成を有するものほど効果的である。

【0019】油脂に対するホスファチジルセリン高含有リン脂質の配合割合は、そのホスファチジルセリン含量にもよるが、最終組成物に対し60重量%以下、好ましくは40重量%以下である。

【0020】本発明のホスファチジルセリン高含有油溶組成物中に含まれるホスファチジルエタノールアミンは、得られたホスファチジルセリン高含有油溶組成物中の最終リン脂質組成に対して5～40重量%（特に10～20重量%）になるように加えるとその効果が発揮される。

【0021】ホスファチジルコリンは加えなくてもホスファチジルエタノールアミンのみを加えるだけで流動性は向上するが、ホスファチジルコリンも得られたホスファチジルセリン高含有油溶組成物中の最終リン脂質組成に対して5～40重量%（特に10～20重量%）になるようにホスファチジルエタノールアミンと併せて加えると、流動性が更に高まる場合がある。

【0022】一般に流通しているレシチン組成物は、ホスファチジルエタノールアミン、ホスファチジルコリンの両方を含んでいるので、このような組成物を上記の条件に当てはまるように配合しても、効果は発揮される。

【0023】このようにして製造したホスファチジルセリン高含有油溶組成物は、透明度、流動性が高く、安定性にも優れているので、食品加工におけるメリットは大きいと考えられる。

【0024】

【実施例】以下、本発明を実施例により説明する。

実施例1 [ホスファチジルセリン（PS）高含有リン脂質（PS含量65重量%）の液状油脂への溶解]  
PS高含有リン脂質を、30重量%になるように液状油脂に溶解した（最終PS含量19.5重量%）。液状油脂は、大豆油、ドコサヘキサエン酸（DHA）油、中鎖脂肪酸トリグリセリド（MCT）を用い、ホスファチジルエタノールアミン（PE：PE含量86.5重量%）を加え、溶解性に対する影響を下記判断基準に従い目視で観察した。結果を次の表1に示す。

【0025】（流動性）

－：極めて低い

＋：低い

++：高い

+++：極めて高い

（透明度）

— : 白濁  
+ : やや白濁  
++ : 透明

【0026】

【表1】

液状油脂種類	DHA油		大豆油		MCT	
PS高含有リン脂質	33.0	33.0	33.0	33.0	33.0	33.0
液状油脂	67.0	61.2	67.0	61.2	67.0	61.2
PE	0.0	5.8	0.0	5.8	0.0	5.8
流動性	—	—	—	+	—	++
透明度	—	+	—	+	—	++

(重量%)

【0027】表1に示したようにPEの添加により溶解性の向上が認められた。また、PEの添加による溶解性の向上は、ドコサヘキサエン酸(DHA)が最も高く、次いで大豆油、中鎖脂肪酸トリグリセリド(MCT)の\*

\*順であったことから、油脂の脂肪酸鎖の炭素数が少ないほどこの効果が高いことが判った。

【0028】続いて、最も効果の高かったMCTに関して詳細な検討を行なった。ホスファチジルコリン(PC)、PE混合物(PC含量38.3重量%、PE含量38.8重量%)を0~30重量%になるように加え、溶解性に対する影響を観察した。結果を次の表2に示す。尚、流動性及び透明度の評価は表1と同様に行った。

10 【0029】表2に示すように、MCTに対する総リン脂質含量が高くなっているにもかかわらず、PE及びPCをリン脂質組成に対して10~20重量%加えることにより流動性、透明度に優れた油溶組成物が得られることが判った。

【0030】

【表2】

	1	2	3	4	5	6	7	8	9	10
PS高含有リン脂質	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
MCT	39.8	50.0	53.7	57.1	60.0	62.4	64.7	66.7	68.4	70.0
PC、PE混合物	30.2	20.0	16.3	12.9	10.0	7.6	5.3	3.3	1.6	0.0
総リン脂質含量	60.2	50.0	46.3	42.9	40.0	37.6	35.3	33.3	31.6	30.0
リン脂質組成に対するPEの割合	19.5	15.5	13.7	11.7	9.7	7.8	5.8	3.8	2.0	0.0
リン脂質組成に対するPCの割合	19.2	15.3	13.5	11.5	9.6	7.7	5.8	3.8	1.8	0.0
流動性	++	+++	+++	+++	++	+	+	—	—	—
透明度	+	++	++	++	++	++	—	—	—	—

(重量%)

【0031】実施例2 [PC、PE混合物を加えて溶解させた油溶組成物の安定性]

実施例1の方法で溶解したPS高含有リン脂質MCT溶解物(PC、PE混合物16.3重量%添加)中のPS含有量を、薄層クロマトグラフィー上のスポットの濃淡※

※より測定し、その安定性を確認した。結果を次の表3に示す。

【0032】

【表3】

保存温度	1ヶ月保存時	6ヶ月保存時
4℃	95	94.3
室温	90.5	85.3
4℃(酢酸3%添加溶解物)	—	73.5(2ヶ月保存時)

【0033】表3は、製造直後のPS含量を100%とした時の値を示したものである。表3に示す通り、酸を加えて溶解させたものと比べて、PSの安定性が高いことが判った。

【0034】

40 【発明の効果】本発明は以上説明した通り、ホスファチジルセリンを高濃度に含有することができ、しかも、得られたものは透明かつ流動性が高い特徴を有する油溶組成物を得ることができるという効果がある。

## 【手続補正書】

【提出日】平成11年11月30日(1999.11.30)

## 【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】0027

【補正方法】変更

【補正内容】

\*【0027】表1に示したようにPEの添加により溶解性の向上が認められた。また、PEの添加による溶解性の向上は、中鎖脂肪酸トリグリセリド(MCT)が最も高く、次いで大豆油、ドコサヘキサエン酸(DHA)の順であったことから、油脂の脂肪酸鎖の炭素数が少ないほどこの効果が高いことが判った。

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フロントページの続き

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Fターム(参考) 4B026 DC05 DG01 DG11 DL02 DX01  
4H050 AA01 AA02 AB20 BB17

【公報種別】特許法第17条の2の規定による補正の掲載

【部門区分】第3部門第2区分

【発行日】平成13年12月11日(2001.12.11)

【公開番号】特開2001-122884(P2001-122884A)

【公開日】平成13年5月8日(2001.5.8)

【年通号数】公開特許公報13-1229

【出願番号】特願平11-303577

【国際特許分類第7版】

C07F 9/10

A23D 9/007

// A23J 7/00

【FI】

C07F 9/10 A

A23J 7/00

A23D 9/00 516

【手続補正書】

【提出日】平成13年5月28日(2001.5.28) \* 【補正方法】変更  
【補正内容】

【手続補正1】

【0030】

【補正対象書類名】明細書

【表2】

【補正対象項目名】0030

\*

	1	2	3	4	5	6	7	8	9	10
PS高含有リン脂質	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
MCT	39.8	50.0	53.7	57.1	60.0	62.4	64.7	66.7	68.4	70.0
PC, PE混合物	30.2	20.0	16.3	12.9	10.0	7.6	5.3	3.3	1.6	0.0
総リン脂質含量	60.2	50.0	46.3	42.9	40.0	37.6	35.3	33.3	31.6	30.0
リン脂質組成に対するPEの割合	19.5	15.5	13.7	11.7	9.7	7.8	5.8	3.8	2.0	0.0
リン脂質組成に対するPCの割合	19.2	15.3	13.5	11.5	9.6	7.7	5.8	3.8	1.9	0.0
流動性	++	+++	+++	+++	++	+	+	-	-	-
透明度	+	++	++	++	++	++	-	-	-	-

(重量%)

[JP,2001-122884,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS EXAMPLE WRITTEN AMENDMENT  
CORRECTION OR AMENDMENT

\* NOTICES \*

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2.\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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## CLAIMS

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[Claim(s)]

[Claim 1]A manufacturing method of an oil soluble compound highly-containing phosphatidylserine dissolving phosphatidylserine quantity content phospholipid in liquefied fats and oils with phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine.

[Claim 2]In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 1, As phosphatidylserine quantity content phospholipid, a phospholipid composition which contains phosphatidylserine 20% of the weight or more is used, A phosphatidylethanolamine content to the last phospholipid composition this phospholipid composition 5 to 40 % of the weight, Or a manufacturing method of an oil soluble compound highly-containing phosphatidylserine which a phosphatidylethanolamine content is 5 to 40 % of the weight, and is characterized by

adding to said liquefied fats and oils so that a phosphatidylcholine content may be 5 to 40% of the weight.

[Claim 3]In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 2, A phosphatidylethanolamine content to the last phospholipid composition said phospholipid composition 10 to 20 % of the weight, Or a manufacturing method of an oil soluble compound highly-containing phosphatidylserine which a phosphatidylethanolamine content is 10 to 20 % of the weight, and is characterized by adding to said liquefied fats and oils so that a phosphatidylcholine content may be 10 to 20% of the weight.

[Claim 4]An oil soluble compound highly-containing phosphatidylserine obtained by which manufacturing method indicated to claims 1-3.

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[Translation done.]

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the method for manufacturing the oil soluble compound containing phosphatidylserine.

[0002]

[Description of the Prior Art]Phosphatidylserine is a kind of phospholipid.

It is the substance which exists in vegetation or an animal universally.

By carrying out 100-300 mg/day ingestion of the phosphatidylserine in recent years, There is a report that a cerebral function improves (Amaducci.). L. and the SMID group, Psychopharmacol. Bull., 24, p130-134, 1988, Cenacchi T. et.al., Aging Clin. Exp. Res., 5, p123-133, 1993, More than it is mere nutritional information, the work attracts attention as a food composition which has a cerebral function improvement function.

[0003]The phosphatidylserine in the phospholipid contained in a natural ingredient does not exceed 20% in the brain of the animal made [ most ] severalpercent in vegetation, either. Therefore, it is difficult to take in only the phosphatidylserine which exhibits a physiological function from a meal, and it is a realistic method to take in the constituent



containing phosphatidylserine auxiliary.

[0004] There are the method of carrying out fractionation of the phospholipid extracted from the natural component as a method of obtaining the constituent which contains phosphatidylserine in high concentration, or manufacturing by transphosphatidylation, etc.

[0005] However, the solubility over fats and oils (for example, soybean oil etc.) is low, and the phospholipid composition which contains phosphatidylserine in high concentration will become hard, if temperature falls even if you make it dissolve by applying heat, and it is not preferred on food manufacturing. Therefore, it becomes important to carry out dilution mixing to fats and oils, to give mobility, and to enable it to fill up a capsule.

[0006] However, if the rate of the fats and oils which are a solvent is raised, the phosphatidylserine content in a final oil soluble compound will become low.

[0007] On the other hand as a method of raising the mobility of a phospholipid composition, the method (U.S. Pat. No. 2,194,842 "fatty acid".) of adding an extensive kind of acid The patent No. 2,374,681 "sulfonic acid", the patent No. 2,391,462 "aquosity acid", etc., The method (U.S. Pat. No. 3,357,918) of adding the salt of a specific quantity of magnesium, calcium, and aluminum of a certain kind, the method (JP,61-15650,A) of adding tocopherol further, etc. are indicated as a patent.

[0008]

[Problem(s) to be Solved by the Invention] However, these methods do not assume the phospholipid composition which is the natural component of containing in high concentration, and does not obtain phosphatidylserine, and did not actually raise the mobility of this oil soluble compound except the method of adding acid. Although the method of adding acid was effective, since decomposition of the phosphatidylserine in the oil soluble compound considered to be based on acid was checked, it was thought that it was not practical.

[0009] This invention can contain phosphatidylserine in high concentration, and, moreover, what was obtained aims at manufacturing the oil soluble compound which has transparence and the feature that mobility is high.

[0010]

[Means for Solving the Problem] A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 1 is the

method of dissolving phosphatidylserine quantity content phospholipid in liquefied fats and oils with phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine.

[0011]A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 2, In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 1, As phosphatidylserine quantity content phospholipid, a phospholipid composition which contains phosphatidylserine 20% of the weight or more is used, It is the method of a phosphatidylethanolamine content to the last phospholipid composition being 5 to 40 % of the weight, and a phosphatidylethanolamine content being 5 to 40 % of the weight, and adding this phospholipid composition to said liquefied fats and oils so that a phosphatidylcholine content may be 5 to 40% of the weight.

[0012]A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 3, In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 2, It is the method of a phosphatidylethanolamine content to the last phospholipid composition being 10 to 20 % of the weight, and a phosphatidylethanolamine content being 10 to 20 % of the weight, and adding said phospholipid composition to said liquefied fats and oils so that a phosphatidylcholine content may be 10 to 20% of the weight.

[0013]An oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 4 is about an oil soluble compound which was obtained by which manufacturing method indicated to claims 1-3 and which contains phosphatidylserine in high concentration.

[0014]

[Embodiment of the Invention]This invention is the method of dissolving phosphatidylserine quantity content phospholipid in liquefied fats and oils with phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine. Thereby, phosphatidylserine can be contained in high concentration and the oil soluble compound which moreover has transparence and the feature that mobility is high can be obtained.

[0015]Phosphatidylserine quantity content phospholipid in this invention, An order of the addition to the liquefied fats and oils of phosphatidylethanolamine or

phosphatidylethanolamine, and phosphatidylcholine in liquefied fats and oils  
phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine. After  
dissolving, it is possible for nebula not to have preferably an order of dissolving  
phosphatidylserine quantity content phospholipid, either, and to dissolve.

[0016]What contains phosphatidylserine 20% of the weight or more can be preferably  
used for phosphatidylserine quantity content phospholipid of this invention. Restriction  
in particular does not have manufacture, the thing which carried out fractionation  
concentration of them further, or the thing manufactured by the organic synthesis  
method in that manufacturing method by the thing which condensed what extracted  
this phosphatidylserine quantity content phospholipid from the natural component or D,  
and a transition reaction with L-serine, either.

[0017]If the phosphatidylethanolamine and phosphatidylcholine of this invention could  
also be manufactured by what kind of method and it is contained in the range with the  
desirable last phospholipid composition, purity in particular of  
phosphatidylethanolamine and phosphatidylcholine will not be made into a problem,  
either.

[0018]If the liquefied fats and oils which dissolve phosphatidylserine quantity content  
phospholipid, phosphatidylethanolamine or phosphatidylethanolamine, and  
phosphatidylcholine are liquefied at ordinary temperature, they are good. For example,  
the vegetable fats and oils of soybean oil, corn oil, safflower oil, olive oil, peanut oil, etc.  
Although fats and oils, such as medium-chain-fatty-acid triglyceride manufactured by  
animal fat and oil like fish oil or enzyme ester composition, etc. may be sufficient and  
each diglyceride and monoglyceride are also available, it is as effective as what has  
short fatty acid composition.

[0019]Although the blending ratio of phosphatidylserine quantity content phospholipid  
to fats and oils is based also on the phosphatidylserine content, it is 40 or less % of the  
weight preferably 60 or less % of the weight to a final composition thing.

[0020]The effect will be demonstrated, if the phosphatidylethanolamine contained in  
the oil soluble compound highly-containing phosphatidylserine of this invention is  
added so that it may become 5 to 40% of the weight (especially 10 to 20 % of the  
weight) to the last phospholipid composition in the obtained oil soluble compound  
highly-containing phosphatidylserine.

[0021]Even if it does not add phosphatidylcholine, mobility improves only by adding only

phosphatidylethanolamine, but. If it combines with phosphatidylethanolamine and adds so that it may become 5 to 40% of the weight (especially 10 to 20 % of the weight) to the last phospholipid composition in the oil soluble compound highly-containing phosphatidylserine from which phosphatidylcholine was also obtained, mobility may increase further.

[0022]An effect is demonstrated, even if it blends such a constituent so that it may be applied to the above-mentioned conditions since the lecithin composition thing which is generally circulating contains both phosphatidylethanolamine and phosphatidylcholine.

[0023]Thus, the manufactured oil soluble compound highly-containing phosphatidylserine has transparency and high mobility, and since it excels also in stability, it is thought that the merit in food processing is large.

[0024]

[Example]Hereafter, an example explains this invention.

Example 1 [the dissolution in the liquefied fats and oils of phosphatidylserine (PS) high content phospholipid (65 % of the weight of PS contents)]

PS quantity-content-phospholipid-was-dissolved-in-liquefied-fats-and-oils-so-that-it-might-become-30% of the weight (19.5 % of the weight of last PS contents). Liquefied fats and oils added phosphatidylethanolamine (86.5 % of the weight of PE:PE contents) using soybean oil, a docosahexaenoic acid (DHA) oil, and medium-chain-fatty-acid triglyceride (MCT), and observed influence on solubility visually in accordance with the following decision criterion. A result is shown in the next table 1.

[0025]( Mobility)

- : very low + : Low ++ : High +++: It is very high (transparency).

- :nebula + : a little -- nebula ++: — transparent [0026]

[Table 1]

液状油脂種類	DHA油		大豆油		MCT	
PS 高含有リン脂質	33.0	33.0	33.0	33.0	33.0	33.0
液状油脂	67.0	61.2	67.0	61.2	67.0	61.2
PE	0.0	5.8	0.0	5.8	0.0	5.8
流動性	—	—	—	+	—	++
透明度	—	+	—	+	—	++

(重量%)

[0027]Soluble improvement was accepted by addition of PE as shown in Table 1. The soluble improvement by addition of PE was understood that docosahexaenoic acid (DHA) is the highest, and this effect is so high that there are few carbon numbers of the fatty acid chain of fats and oils since it was subsequently the order of soybean oil and medium-chain-fatty-acid triglyceride (MCT).

[0028]Then, detailed examination was performed about MCT which was the highest as for the effect. Phosphatidylcholine (PC) and PE mixture (38.3 % of the weight of PC contents, 38.8 % of the weight of PE contents) were added so that it might become 0 to 30% of the weight, and influence on solubility was observed. A result is shown in the next table 2. Evaluation of mobility and transparency was performed like Table 1.

[0029]Although the total phospholipid content to MCT was high as shown in Table 2, by adding PE and PC ten to 20% of the weight to phospholipid composition showed that the oil soluble compound excellent in mobility and transparency was obtained.

[0030]

[Table 2]

	1	2	3	4	5	6	7	8	9	10
PS 高含有リン脂質	20.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
MCT	39.8	50.0	53.7	57.1	60.0	62.4	64.7	66.7	68.4	70.0
PC, PE 混合物	30.2	20.0	16.3	12.9	10.0	7.6	5.3	3.3	1.6	0.0
総リン脂質含量	60.2	50.0	46.3	42.9	40.0	37.6	35.3	33.3	31.6	30.0
リン脂質組成に対するPEの割合	19.5	15.5	13.7	11.7	9.7	7.8	5.8	3.8	2.0	0.0
リン脂質組成に対するPCの割合	19.2	15.3	13.5	11.5	9.6	7.7	5.8	3.8	1.9	0.0
割合流動性	++	+++	+++	+++	++	+	+	-	-	-
透明度	+	++	++	++	++	++	-	-	-	-

(重量%)

[0031]Example 2 [stability of the oil soluble compound in which added PC and PE mixture and it was made to dissolve]

PS content in the PS quantity content phospholipid MCT melted object (PC, 16.3 % of the weight of PE mixture addition) which dissolved by the method of Example 1 was measured from the shade of the spot on thin layer chromatography, and the stability was checked. A result is shown in the next table 3.

[0032]

[Table 3]

保存温度	1 ヶ月保存時	6 ヶ月保存時
4 ℃	95	94.3
室温	90.5	85.3
4 ℃(酢酸 3 % 添加溶解物)	—	73.5(2 ヶ月保存時)

[0033]Table 3 shows a value when PS content immediately after manufacture is made into 100%. Compared with what added acid and was dissolved, it turned out that the stability of PS is high as shown in Table 3.

[0034]

[Effect of the Invention]This invention can contain phosphatidylserine in high concentration as it was explained above, and moreover, some which were obtained are effective in the ability to obtain the oil soluble compound which has transparency and the feature that mobility is high.

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[Translation done.]

## TECHNICAL FIELD

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[Field of the Invention]This invention relates to the method for manufacturing the oil soluble compound containing phosphatidylserine.

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[Translation done.]

## PRIOR ART

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[Description of the Prior Art]Phosphatidylserine is a kind of phospholipid. It is the substance which exists in vegetation or an animal universally.

By carrying out 100–300 mg/day ingestion of the phosphatidylserine in recent years, There is a report that a cerebral function improves (Amaducci). L. and the SMID group, Psychopharmacol. Bull., 24, p130–134, 1988, Cenacchi T. et.al., Aging Clin. Exp. Res., 5, p123–133, 1993, More than it is mere nutritional information, the work attracts attention as a food composition which has a cerebral function improvement function.

[0003]The phosphatidylserine in the phospholipid contained in a natural ingredient does not exceed 20% in the brain of the animal made [ most ] severalpercent in vegetation, either. Therefore, it is difficult to take in only the phosphatidylserine which exhibits a physiological function from a meal, and it is a realistic method to take in the constituent containing phosphatidylserine auxiliary.

[0004]There are the method of carrying out fractionation of the phospholipid extracted from the natural component as a method of obtaining the constituent which contains phosphatidylserine in high concentration, or manufacturing by transphosphatidylation, etc.

[0005]However, the solubility over fats and oils (for example, soybean oil etc.) is low, and the phospholipid composition which contains phosphatidylserine in high concentration will become hard, if temperature falls even if you make it dissolve by applying heat, and it is not preferred on food manufacturing. Therefore, it becomes important to carry out dilution mixing to fats and oils, to give mobility, and to enable it to fill up a capsule.

[0006]However, if the rate of the fats and oils which are a solvent is raised, the phosphatidylserine content in a final oil soluble compound will become low.

[0007]On the other hand as a method of raising the mobility of a phospholipid composition, the method (U.S. Pat. No. 2,194,842 "fatty acid".) of adding an extensive kind of acid The patent No. 2,374,681 "sulfonic acid", the patent No. 2,391,462 "aquosity acid", etc., The method (U.S. Pat. No. 3,357,918) of adding the salt of a specific quantity of magnesium, calcium, and aluminum of a certain kind, the method (JP,61–15650,A) of adding tocopherol further, etc. are indicated as a patent.

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[Translation done.]

## EFFECT OF THE INVENTION

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[Effect of the Invention] This invention can contain phosphatidylserine in high concentration as it was explained above, and moreover, some which were obtained are effective in the ability to obtain the oil soluble compound which has transparency and the feature that mobility is high.

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[Translation done.]

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, these methods do not assume the phospholipid composition which is the natural component of containing in high concentration, and does not obtain phosphatidylserine, and did not actually raise the mobility of this oil soluble compound except the method of adding acid. Although the method of adding acid was effective, since decomposition of the phosphatidylserine in the oil soluble compound considered to be based on acid was checked, it was thought that it was not practical.

[0009] This invention can contain phosphatidylserine in high concentration, and, moreover, what was obtained aims at manufacturing the oil soluble compound which has transparency and the feature that mobility is high.

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[Translation done.]

## MEANS

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[Means for Solving the Problem] A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 1 is the method of dissolving phosphatidylserine quantity content phospholipid in liquefied fats



and oils with phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine.

[0011]A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 2, In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 1, As phosphatidylserine quantity content phospholipid, a phospholipid composition which contains phosphatidylserine 20% of the weight or more is used, It is the method of a phosphatidylethanolamine content to the last phospholipid composition being 5 to 40 % of the weight, and a phosphatidylethanolamine content being 5 to 40 % of the weight, and adding this phospholipid composition to said liquefied fats and oils so that a phosphatidylcholine content may be 5 to 40% of the weight.

[0012]A manufacturing method of an oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 3, In a manufacturing method of an oil soluble compound highly-containing phosphatidylserine indicated to claim 2, It is the method of a phosphatidylethanolamine content to the last phospholipid composition being 10 to 20 % of the weight, and a phosphatidylethanolamine content being 10 to 20 % of the weight, and adding said phospholipid composition to said liquefied fats and oils so that a phosphatidylcholine content may be 10 to 20% of the weight.

[0013]An oil soluble compound highly-containing phosphatidylserine concerning an invention indicated to claim 4 is about an oil soluble compound which was obtained by which manufacturing method indicated to claims 1-3 and which contains phosphatidylserine in high concentration.

[0014]

[Embodiment of the Invention]This invention is the method of dissolving phosphatidylserine quantity content phospholipid in liquefied fats and oils with phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine. Thereby, phosphatidylserine can be contained in high concentration and the oil soluble compound which moreover has transparence and the feature that mobility is high can be obtained.

[0015]Phosphatidylserine quantity content phospholipid in this invention, An order of the addition to the liquefied fats and oils of phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine in liquefied fats and oils

phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine. After dissolving, it is possible for nebula not to have preferably an order of dissolving phosphatidylserine quantity content phospholipid, either, and to dissolve.

[0016]What contains phosphatidylserine 20% of the weight or more can be preferably used for phosphatidylserine quantity content phospholipid of this invention. Restriction in particular does not have manufacture, the thing which carried out fractionation concentration of them further, or the thing manufactured by the organic synthesis method in that manufacturing method by the thing which condensed what extracted this phosphatidylserine quantity content phospholipid from the natural component or D, and a transition reaction with L-serine, either.

[0017]If the phosphatidylethanolamine and phosphatidylcholine of this invention could also be manufactured by what kind of method and it is contained in the range with the desirable last phospholipid composition, purity in particular of phosphatidylethanolamine and phosphatidylcholine will not be made into a problem, either.

[0018]If the liquefied fats and oils which dissolve phosphatidylserine quantity content phospholipid, phosphatidylethanolamine or phosphatidylethanolamine, and phosphatidylcholine are liquefied at ordinary temperature, they are good. For example, the vegetable fats and oils of soybean oil, corn oil, safflower oil, olive oil, peanut oil, etc. Although fats and oils, such as medium-chain-fatty-acid triglyceride manufactured by animal fat and oil like fish oil or enzyme ester composition, etc. may be sufficient and each diglyceride and monoglyceride are also available, it is as effective as what has short fatty acid composition.

[0019]Although the blending ratio of phosphatidylserine quantity content phospholipid to fats and oils is based also on the phosphatidylserine content, it is 40 or less % of the weight preferably 60 or less % of the weight to a final composition thing.

[0020]The effect will be demonstrated, if the phosphatidylethanolamine contained in the oil soluble compound highly-containing phosphatidylserine of this invention is added so that it may become 5 to 40% of the weight (especially 10 to 20 % of the weight) to the last phospholipid composition in the obtained oil soluble compound highly-containing phosphatidylserine.

[0021]Even if it does not add phosphatidylcholine, mobility improves only by adding only phosphatidylethanolamine, but. If it combines with phosphatidylethanolamine and adds

so that it may become 5 to 40% of the weight (especially 10 to 20 % of the weight) to the last phospholipid composition in the oil soluble compound highly-containing phosphatidylserine from which phosphatidylcholine was also obtained, mobility may increase further.

[0022]An effect is demonstrated, even if it blends such a constituent so that it may be applied to the above-mentioned conditions since the lecithin composition thing which is generally circulating contains both phosphatidylethanolamine and phosphatidylcholine.

[0023]Thus, the manufactured oil soluble compound highly-containing phosphatidylserine has transparency and high mobility, and since it excels also in stability, it is thought that the merit in food processing is large.

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[Translation done.]

## EXAMPLE

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[Example]Hereafter, an example explains this invention.

Example 1 [the dissolution in the liquefied fats and oils of phosphatidylserine (PS) high content phospholipid (65 % of the weight of PS contents)]

PS quantity content phospholipid was dissolved in liquefied fats and oils so that it might become 30% of the weight (19.5 % of the weight of last PS contents). Liquefied fats and oils added phosphatidylethanolamine (86.5 % of the weight of PE:PE contents) using soybean oil, a docosahexaenoic acid (DHA) oil, and medium-chain-fatty-acid triglyceride (MCT), and observed influence on solubility visually in accordance with the following decision criterion. A result is shown in the next table 1.

[0025]( Mobility)

- : very low + : Low ++ : High +++: It is very high (transparency).

- :nebula + : a little -- nebula ++: -- transparent [0026]

[Table 1]

液状油脂種類	DHA油		大豆油		MCT	
P S 高含有リン脂質	33.0	33.0	33.0	33.0	33.0	33.0
液状油脂	67.0	61.2	67.0	61.2	67.0	61.2
P E	0.0	5.8	0.0	5.8	0.0	5.8
流動性	—	—	—	+	—	++
透明度	—	+	—	+	—	++

(重量%)

[0027]Soluble improvement was accepted by addition of PE as shown in Table 1. The soluble improvement by addition of PE was understood that docosahexaenoic acid (DHA) is the highest, and this effect is so high that there are few carbon numbers of the fatty acid chain of fats and oils since it was subsequently the order of soybean oil and medium-chain-fatty-acid triglyceride (MCT).

[0028]Then, detailed examination was performed about MCT which was the highest as for the effect. Phosphatidylcholine (PC) and PE mixture (38.3 % of the weight of PC contents, 38.8 % of the weight of PE contents) were added so that it might become 0 to 30% of the weight, and influence on solubility was observed. A result is shown in the next table 2. Evaluation of mobility and transparency was performed like Table 1.

[0029]Although the total phospholipid content to MCT was high as shown in Table 2, by adding PE and PC ten to 20% of the weight to phospholipid composition showed that the oil soluble compound excellent in mobility and transparency was obtained.

[0030]

[Table 2]

	1	2	3	4	5	6	7	8	9	10
P S 高含有リン脂質	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
MCT	39.8	50.0	53.7	57.1	60.0	62.4	64.7	66.7	68.4	70.0
P C, P E 混合物	30.2	20.0	16.3	12.9	10.0	7.6	5.3	3.3	1.6	0.0
総リン脂質含量	60.2	50.0	46.3	42.9	40.0	37.6	35.3	33.3	31.6	30.0
リン脂質組成に対するPEの割合	19.5	15.5	13.7	11.7	9.7	7.8	5.8	3.8	2.0	0.0
リン脂質組成に対するPCの割合	19.2	15.3	13.5	11.5	9.6	7.7	5.8	3.8	1.9	0.0
割合流動性	++	+++	+++	+++	++	+	+	—	—	—
透明度	+	++	++	++	++	++	—	—	—	—

(重量%)

[0031]Example 2 [stability of the oil soluble compound in which added PC and PE mixture and it was made to dissolve]

PS content in the PS quantity content phospholipid MCT melted object (PC, 16.3 % of the weight of PE mixture addition) which dissolved by the method of Example 1 was measured from the shade of the spot on thin layer chromatography, and the stability was checked. A result is shown in the next table 3.

[0032]

[Table 3]

保存温度	1ヶ月保存時	6ヶ月保存時
4℃	95	94.3
室温	90.5	85.3
4℃(酢酸3%添加溶解物)	—	73.5(2ヶ月保存時)

[0033]Table 3 shows a value when PS content immediately after manufacture is made into 100%. Compared with what added acid and was dissolved, it turned out that the stability of PS is high as shown in Table 3.

[0034]

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[Translation done.]

## WRITTEN AMENDMENT

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[Written amendment]

[Filing date]November 30, Heisei 11 (1999.11.30)

[Amendment 1]

[Document to be Amended]Specification

[Item(s) to be Amended]0027

[Method of Amendment]Change

[Proposed Amendment]

[0027]Soluble improvement was accepted by addition of PE as shown in Table 1. The

soluble improvement by addition of PE was understood that medium-chain-fatty-acid triglyceride (MCT) is the most expensive, and this effect is so high that there are few carbon numbers of the fatty acid chain of fats and oils since it was subsequently the order of soybean oil and docosahexaenoic acid (DHA).

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[Translation done.]

#### CORRECTION OR AMENDMENT

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[Kind of official gazette]Printing of amendment by the regulation of 2 of Article 17 of Patent Law

[Section classification] The 2nd classification of the part III gate

[Publication date]December 11 (2001.12.11), Heisei 13

[Publication No.]JP,2001-122884,A (P2001-122884A)

[Date of Publication]May 8, Heisei 13 (2001.5.8)

[Annual volume number] Publication of patent applications 13-1229

[Application number]Japanese Patent Application No. 11-303577

[The 7th edition of International Patent Classification]

C07F 9/10

A23D 9/007

// A23J 7/00

[FI]

C07F 9/10 A

A23J 7/00

A23D 9/00 516

[Written amendment]

[Filing date] May 28, Heisei 13 (2001.5.28)

[Amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] 0030

[Method of Amendment] Change

[Proposed Amendment]

[0030]

[Table 2]

	1	2	3	4	5	6	7
P S 高含有リン脂質	30.0	30.0	30.0	30.0	30.0	30.0	30.0
M C T	39.8	50.0	53.7	57.1	60.0	62.4	64.0
P C, P E 混合物	30.2	20.0	16.3	12.9	10.0	7.6	5.0
総リン脂質含量	60.2	50.0	46.3	42.9	40.0	37.6	35.0
リン脂質組成に対するPEの割合	19.5	15.5	13.7	11.7	9.7	7.8	5.0
リン脂質組成に対するPCの割合	19.2	15.3	13.5	11.5	9.6	7.7	5.0
流動性	++	+++	+++	+++	++	+	+
透明度	+	++	++	++	++	++	-

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[Translation done.]

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